

Unconfirmed accelerants:

Controversial evidence in fire investigations

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Abstract

Fire investigation is arguably one of the most difficult areas of investigation. The fire scene and available evidence has often been burnt, melted, smoke stained, water damaged and trampled on, but the fire investigator still has to make important distinctions between whether a fire was accidental or deliberate (arson). Modern fire investigations often rely on portable electronic detectors to identify ignitable liquid residue (ILR), or accelerant detection canines (ADCs), trained on a number of target substances. An analysis of cases from England and Wales, the United States of America (USA) and Canada demonstrate that sophisticated admissibility frameworks have not been effective in rejecting opinion testimony given by investigators and dog handlers that unconfirmed dog alerts where laboratory tests were negative provided proof of arson. This is problematic and

controversial, and the authors conclude that such testimony is not compatible with modern forensic or scientific standards and should not be admitted into courts.

Keywords

Fire investigation, arson investigation, unconfirmed accelerant, admissibility, expert evidence, opinion, search dogs, accelerant detection canine.

Introduction

If someone said that dogs have provided ‘irrefutable’ evidence in criminal courts, this would most likely be met with skepticism, laughter or disdain. However, this is what has happened in several jurisdictions, largely enabled by admissibility frameworks that treat such evidence as capable of belief. The dog does not appear in court to woof its testimony. Instead its evidence is heard through a proxy or an intermediary, namely the dog handler. That dogs have an olfactory system that far exceeds that of humans is accepted and not refuted. However, that ‘dog testimony’ has been the known source of wrongful convictions also needs to be acknowledged. For example, William Dillon was convicted of murder in Florida, USA, in 1981 and spent nearly 27 years in prison based on testimony from a dog handler, questionable eyewitness identification and a jailhouse informant. The dog handler testified that his dog had linked Dillon to the crime scene and

a T-shirt worn by the perpetrator.¹ DNA testing of the T-shirt, which had the victim's blood on it, excluded Dillon and he was exonerated in 2008.² This is only one example of a dog handler exaggerating or misunderstanding the capability of their dog in a criminal investigation and subsequent court case. Many more cases exist from a variety of fields including fire and arson investigations.

The first half of this article focuses on fire and arson investigations, the detection of accelerants and a number of critical issues that are associated with this process. Fire investigations should be scientifically and forensically sound and produce evidence that can be presented in court. The use of accelerant detection canines (ADCs), dogs trained to indicate the presence of an accelerant, is common in fire investigations. Once such a dog has alerted, samples must be taken and the presence of a potential accelerant needs to be confirmed in a laboratory, through scientific testing. Nevertheless, in a number of cases from England and Wales, the United States of America (USA) and Canada, evidence from unconfirmed dog alerts have been admitted into courts, with fire investigators or dog handlers giving opinion expert evidence, even when subsequent laboratory tests were either never conducted or where these test were negative. [Problems associated with tunnel vision and case construction are known to occur in criminal investigations where, instead of an unbiased fact-finding mission, all focus is on one](#)

¹ The National Registry of Exonerations. William Dillon, <http://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=3177> (2012, accessed 4 July 2017).

² Innocence Project. William Dillon, <https://www.innocenceproject.org/cases/william-dillon/> (ND, accessed 4 July 2017).

particular suspect and only evidence that supports the guilt of that suspect is used in the narrative of the favoured hypothesis of what happened.³ Fire investigations can be seen as particularly vulnerable to some of these problems as they are the starting point for any criminal investigation, and the fire investigator has to make the important decision of whether a fire was accidental or deliberate (arson). Furthermore, these decisions will influence any subsequent court proceedings.

The second half of this article focuses on the admissibility frameworks of England and Wales, USA and Canada. These three jurisdictions are all shaped by the English common law and share broad similarities in how the admission of expert opinion evidence is regulated, which make them suitable for comparison. Cases where unconfirmed ADC alerts have been used in court are analysed, and a number of key points to consider when dealing with such evidence are identified. There are concerns over the way in which unconfirmed dog alerts are admitted into courts with little or no scrutiny. The probative value of an unconfirmed dog alert is minimal, but the prejudicial effect can be immense.

The article concludes that under no circumstances should dog alerts that have not been confirmed through laboratory testing of samples from the fire scene be allowed to be presented in court as proof of arson, through opinion expert evidence given by fire

³ See e.g. Findley KA and Scott MS. The multiple dimension of tunnel vision in criminal cases. *Wis L Rev* 2006; 2: 291-397; Henneberg ML and Loveday BW. 'Off track' police investigations, case construction and flawed forensic practices: An analysis of three fatal stabbings in Sweden, California and England. *Brit J Am Legal Stud* 2015; 4: 499-526.

investigators or dog handlers. It is argued that such evidence is not compatible with modern scientific and forensic methods, standards and principles. Unconfirmed dog alerts must be seen as problematic and controversial as these can be the source of grave miscarriages of justice, including wrongful convictions.

Fire investigations and the scientific method

It is vital that all forensic science expert testimony is methodically robust.⁴ Fire investigation is a specialised discipline of forensic science⁵ that can often be seen as a world unto itself. It is a complex and demanding endeavor that takes place in a hazardous environment, exposing investigators to scientific and professional challenges not found in other fields of forensic science.⁶ Fire investigation is often known as ‘origin and cause’ investigation based on the need for every investigation to answer the two core questions of where and how the fire started. To be able to do this, a fire investigator must have a thorough understanding of many technical and engineering disciplines ranging from fire science and the combustion properties of fuels, through thermodynamics and heat release rates, to building construction and electrical supply equipment. In addition to scientific and technical information, a fire investigator also needs to be able to accurately assess more subjective evidence such as conflicting witness testimony or unpredictable human behavior.

⁴ Carr S, Piasecki E, Tully G et al. Opening the scientific expert’s black box: “Critical trust” as a reformative principle in criminal evidence. *J Crim Law* 2016; 80(5): 364-386.

⁵ Stauffer E, Dolan JA and Newman R. *Fire debris analysis*. London: Academic Press, 2008, p. 5.

⁶ Lentini JJ. *Scientific protocols for fire investigation*. London: Taylor and Francis, 2006, p. xvii.

In order to avoid becoming overwhelmed by the demands of an investigation, and to maintain focus when faced with the often tragic and destructive effects of fire, it is vital that fire investigators follow a systematic and analytical approach.⁷ The recommended approach is based on the scientific method, the methodology that forms the foundation for legitimate scientific and engineering processes.⁸ The scientific method can be applied to fire investigations through a logical and systematic cycle of observation, hypothesis, experimentation and verification.⁹ Fire investigators are expected to collect data, develop testable theories and then continuously refine working hypotheses until a final conclusion is drawn.¹⁰

This methodology clearly illustrates that the process of fire investigation is one of inferring conclusions from given facts. In legal terms an inference drawn from a fact is an opinion,¹¹ therefore a fire investigator's determined cause of fire is an opinion. Indeed, unless the fire investigator was present when the fire started and observed the ignition process, the cause of a fire determined will always be an opinion and not a fact. In legal proceedings, for a cause of fire to be introduced as a relevant fact the court must be satisfied that it is indeed a fact and this should never be achieved as a cause of fire is an

⁷ National Fire Protection Association. *NFPA 921: Guide for fire and explosion investigations 2017*. Quincy: NFPA, 2017, p. 19.

⁸ DeHaan J D and Icove D J. *Kirks fire investigation*. 7th ed. New Jersey: Pearson Education, 2012, p. 12.

⁹ NFPA, see above n.7, pp. 19-20; Dehghani-Tafti P and Bieber P. Folklore and forensics: The challenges of arson investigation and innocence claims. *W Va Law Rev* 2016; 119: 549-619.

¹⁰ Icove DJ and DeHaan JD. *Forensic fire scene reconstruction*. New Jersey: Prentice Hall, 2004.

¹¹ Bond Solon Training. *Law, evidence, procedure and best practice*. Unpublished internal document. Bond Solon Wilmington, 2013, p. 64.

inferred opinion. Opinion evidence can only be introduced in court through expert witness testimony that has satisfied the relevant admissibility framework and associated rules of evidence. In effect this means that all fire investigation testimony regarding the origin and cause of a fire should be treated as expert evidence. In order to give such evidence in court fire investigators must therefore be regarded as an expert witness and prove that they have the knowledge and experience required to give reliable expert testimony.

There are few fields of study where the ability of experts to disagree after analysing the same factual evidence is more of a problem than in fire investigation.¹² The problem is amplified with fires involving fatalities or major losses, which often end in court proceedings or complicated litigation. These serious and often tragic fires tend to focus public attention on the magnitude and cost of the fires and this can complicate the investigator's core role of finding the origin and cause.¹³ The use of the scientific methodology and the associated peer review protocol is specifically aimed at increasing the reliability of fire investigation opinion testimony, although experience continues to show that the more severe the effects of the fire, the greater the chance of disagreement between investigators.¹⁴

¹² Lentini J. Areas of scientific agreement and disagreement: Field investigation. In: Faigman DL, Saks NL, Sanders J et al. (eds) *Modern scientific evidence: The law and science of expert testimony vol 5 (forensics, engineering and economics)*. St Paul: West, 2010, p. 227

¹³ DeHaan and Icove, see above n.8, p. 10.

¹⁴ Icove and DeHaan, see above n.10; Lentini, see above n.12, p. 227.

Arson investigations

The problems associated with fire investigation are further compounded when the fire is intentionally set. All investigations into fires that are deliberately caused not only have to determine the origin and cause of the fire, but these also need to establish the person or persons responsible and then provide proof to the trier of fact.¹⁵ In law, the intentional setting of fires is usually referred to as arson and, in general terms, arson can be defined as the willful and malicious burning of a person's property.¹⁶ However, specific legal definitions of the crime of arson vary across jurisdictions.

In England and Wales arson is legislated against under the terms of the Criminal Damage Act 1971. Under section 1 of the Criminal Damage Act 1971 criminal damage occurs when a person without lawful excuse destroys or damages another person's property intentionally or recklessly. Arson is defined as the offence of criminal damage where the property is destroyed or damaged by fire.¹⁷ In the USA the picture is more complicated as there are fifty-two criminal codes; the Federal Code overlaying that of each of the fifty states and the District of Columbia. Each code contains specific provisions for the requirements of the crime of arson. However, the Model Penal Code, regarded as the closest thing to a USA penal code, provides that a person is guilty of arson if they start a fire or cause an explosion with the purpose of destroying a building or occupied structure

¹⁵ DeHaan and Icove, see above n.8, p. 3.

¹⁶ See e.g. Gannon T and Pina A. Fire setting: Psychopathology, theory and treatment. *Aggress Violent Beh* 2010; 15: 224-238; DeHaan and Icove, see above n.6.

¹⁷ Crown Prosecution Service. *Legal guidance*, <http://www.cps.gov.uk> (2015, accessed 24 February 2017).

of another, or destroying or damaging any property with the purpose of collecting insurance on the loss.¹⁸ The Criminal Code of Canada contains several provisions for the crime of arson, each sharing the definition that a person is guilty of an offence if they intentionally or recklessly cause damage by fire or explosion to property.¹⁹

Although there are differences in the way arson is defined across jurisdictions, and therefore variations in the elements of each offence, the fire investigation into the origin and cause of the fire can be regarded as the most important part of any arson investigation.²⁰ This is because, unlike in many crimes, the fire scene must first be investigated in order to ascertain whether or not a crime has even taken place. It is the conclusion of the fire investigator that the fire was the result of a deliberate act that will result in a criminal investigation into who was responsible for the crime. This means that the determination that a crime has taken place and that a criminal investigation is required depends on the opinion of the fire investigator.

The determining of a fire as caused by an act of arson by a fire investigator therefore has consequences. Suspects charged with and found guilty of arson can expect to see the courts imposing substantial sentences including life imprisonment. In states in the USA

¹⁸ Robinson PH and Dubber MD. The American model penal code: A brief overview. *New Crim L Rev* 2007; 10 (3): 319-341, pp. 319-320. NFPA see above n.7, p.155.

¹⁹ Minister of Justice. *Criminal Code*, <http://laws-lois.justice.gc.ca> (2016, accessed 24 February 2017) p. 458.

²⁰ Ottley BL. Beyond the crime laboratory: The admissibility of unconfirmed forensic evidence in arson cases. *New Eng J Crim Civ. Confinement* 2010; 36: 263-288.

where the death penalty is practiced, instances of arson that result in fatalities may ultimately end with a death sentence. With such serious potential implications to a convicted suspect, the evidence underpinning the investigator's opinion that a fire is indeed a crime of arson is critical.

However, it is a fact that in many cases of incendiary fires there is little physical evidence of their cause. Fires that are deliberately started with the application of a naked flame to a combustible item will leave little or no evidence of the act.²¹ Without definitive physical evidence of the ignition source the fire investigator may have to rely on the analysis and assessment of data such as burn patterns, smoke staining or estimates of when the fire started to reach a conclusion that a fire had a deliberate cause. This type of evidence is subjective and is open to the individual interpretation of investigators, which means that opinions based on such data could be considered less reliable evidence when used in court. Indeed, the misinterpretation of damage patterns by fire investigators have resulted in many wrongful convictions for arson and were identified as a contributory factor in the conviction of Cameron Todd Willingham in Texas, USA, which ultimately led to his execution even though an overwhelming number of experts in fire sciences believe he was innocent.²²

²¹ Lentini, see above n.12, p. 250; DeHaan and Icove, see above n.8, p. 681.

²² See e.g. Lentini J. The evolution of fire investigation and its impact in arson cases. *Crim Just* 2012; 27 (1): 12-62.; Giannell PC. Junk science and the execution of an innocent man. *NYU J L Liberty* 2013; 7 (2): 221-253; Dioso-Villa R. Scientific and legal developments in fire and arson investigation expertise in Texas v Willingham. *Minn J L Sci Tech* 2013; 14 (2): 817-848.

Investigators of arson are faced with the problem that the most important element of the investigation may be the one with the least available physical evidence. Without evidence of the actual ignition source the fire investigator will need to logically infer the ignition sequence from additional data. In such cases, evidence that supports the hypothesis that a fire is the result of arson will assume a greater degree of importance than had evidence of the ignition source been available. One type of corroborative evidence that is regarded as providing compelling evidence to support the conclusion of arson is proof that an accelerant was used in the commission of the offence.²³

Accelerants

In fire investigation terms, an accelerant is defined as a fuel that is used to initiate or increase the intensity, or speed of spread, of fire.²⁴ This definition can be regarded as containing two important considerations in relation to the use of accelerants in starting fires: (i) the types of fuels which are effective accelerants, this covers a wide range of substances, and (ii) for a particular substance to be classed as an accelerant it must have been used for that specific purpose.

Fuels such as paper and kindling wood are commonly used to start legitimate and controlled fires such as bonfires or fires contained in grates for heating. The use of such simple solid fuels, particularly if they are available at the scene, can be equally effective

²³ NFPA, see above n.7; DeHaan and Icove, see above n.8.

²⁴ DeHaan and Icove, see above n.8, p. 674; NFPA, see above n.7, p. 13.

at starting arson fires. These types of accelerants are not only hard to detect and identify as such in the post fire debris, but also the use of these types of common materials minimises the need for materials to be brought to the crime scene, limiting opportunities to link the arsonist with the fire.²⁵

Despite the advantages to the arsonist of a simple and readily available solid fuel, or perhaps because of them, the most common type of accelerant detected by investigators is ignitable liquid. Petrol can be regarded as the most commonly encountered accelerant as it is readily available, inexpensive and easily transported. In addition, it is widely understood that petrol is easy to ignite and will burn with sufficient energy to facilitate fire spread.²⁶ However, many other types of ignitable liquids may be used as accelerants including other petroleum based products such as white spirit or lighter fluid, or non-petroleum based liquids such as methylated sprits or bio-ethanol.

Whichever substance is found, its presence alone within a fire scene does not necessarily mean that it should be classed as an accelerant. A fire investigator must determine whether it has been used to facilitate the ignition or spread of the fire. It is vital therefore that the presence of the substance is understood in relation to its context within the fire

²⁵ DeHaan and Icove, see above n.8, pp.673-674.

²⁶ Stauffer et al., see above n.5, p. 2.

scene.²⁷ To establish whether or not a detected fuel source is actually an accelerant, the fire investigator must determine what the fuel source is and why it is there.

Determining what fuel is actually present is equally important with ignitable liquids as with other fuels. The use of products containing ignitable liquids has increased over the past few decades and it is common to encounter these 'incidental' ignitable liquids during a fire scene investigation.²⁸ For example, the presence of ignitable liquid in a domestic bedroom fire may raise suspicions but if the substance was acetone, a common constituent of nail varnish remover, there could be a valid reason for its presence. However, if the liquid was identified as petrol then an innocent explanation could be more difficult to establish. Furthermore, the investigator must understand why the fuel is present in the scene. It is the specific use of the substance to aid the ignition or spread of the fire that will confirm the presence of an accelerant. It is therefore important that the effect that the presence of the suspected accelerant had on the development of the fire is understood. This will necessitate the fire investigator taking into account the combustion characteristics of the identified substance when interpreting the physical evidence from the fire scene.

It is sometimes difficult to satisfy both the identification and context criteria with simple and readily available solid fuels, therefore the detection of ignitable liquid in a fire scene

²⁷ Stauffer et al., see above n.5, p. 3; DeHaan and Icové, see above n.8, pp. 300-303.

²⁸ Stauffer et al., see above n.5, p. 441.

is often viewed as providing the best forensic evidence for establishing beyond reasonable doubt that a fire is a criminal case of arson. As a result many prosecutions for arson depend on the presence of an ignitable liquid accelerant.²⁹

Detection of ignitable liquid accelerants

Virtually all ignitable liquids are volatile organic compounds. This volatility means that they are easily ignited and burn rapidly, making them effective accelerants. Even if the liquid does not burn, the high ambient temperatures found during a fire will cause it to vaporise quickly. As a result the detection of any ignitable liquid within the debris of a fire can be problematic and in some cases impossible. It is only liquid that has been protected from the flames and heat of the fire that will still be present during the post fire scene examination. The traces that remain are generally referred to as ignitable liquid residue (ILR).³⁰

Fire investigators have long recognised the importance of being able to reliably detect the presence of an ILR in a fire scene. Early descriptions of attempts to locate petroleum products in fire debris date back to 1911 and, in the decades that followed, a number of accounts of varying techniques for the detection and collection of ILR were published.³¹

²⁹ DeHaan and Icove, see above n.8, pp. 673-677; Ottley, see above n.20, p.266.

³⁰ Stauffer et al., see above n.5; DeHaan and Icove, see above n.8; Ottley, see above n.20.

³¹ Stauffer et al., see above n.5, pp. 131-161.

Not all of these could be described as ‘scientific’, such as a 1945 fire investigation book that recommended the tasting of samples of fire debris as an appropriate method.³²

Although tasting may now be regarded as an unusual and redundant technique, the use of smell by investigators to identify the presence of ILR is considerably more common. The sniffing of fire debris was a recognised method in many early texts and is still listed as an acceptable technique in modern fire investigation standard references.³³ There is no doubt that some ignitable liquids, such as petrol, do have a readily identifiable smell. However the sniffing of debris is undesirable for a number of reasons. Firstly, the fire scene will contain toxic and harmful substances that should not be inhaled. Secondly, the human nose is very subjective in its perception of odours and is easily fatigued. In addition, some ignitable liquids do not even have a characteristic smell and all undergo physical and chemical change during a fire, essentially altering their odours.³⁴ These factors, together with the fact that only small quantities of ILR will remain in the debris after a fire, mean that the use of smell should be considered a highly unreliable method of detection.

In reality most modern fire investigators have two alternative methods available for use at fire scenes to detect the presence of ILR in the fire debris: portable electronic detectors or a fire investigation search dog, commonly known as an accelerant detection canine

³² Rethoret H. *Fire investigations*. Montreal: Recording and Statistics Corporation Ltd, 1945.

³³ Stauffer et al., see above n.5; DeHaan and Icové, see above n.8.

³⁴ DeHaan and Icové, see above n.8, pp. 300-302.

(ADC). Portable devices can offer a great deal of sensitivity and can therefore detect potential ILR at very low levels but the detection is not specific to ignitable liquids.³⁵ As a result electronic detectors often give false positives by reacting to substances other than ILR, and false negatives by failing to detect certain types of ILR that may actually be present.

In contrast, the ADC is trained to respond to and alert on specific ILRs. The first ADCs were introduced following a pioneering program undertaken at the request of the Bureau of Alcohol, Tobacco and Firearms³⁶ in the USA in the early 1980s. The aim of the program was to transfer the skills of explosives trained search dogs into the fire scene environment in order to improve the detection of ILR.³⁷ The program was a success as the dogs proved to be a valuable tool. As a result the use of ADCs expanded throughout the USA and then to other countries, with the first dog in the United Kingdom (UK) becoming operational in 1996.³⁸ The continued use of ADCs can be considered as one of the most significant advances in the fight against arson,³⁹ and ADCs are now a common feature in fire investigation teams in the USA, the UK and Canada.

³⁵ Stauffer et al., see above n.5; DeHaan and Icove, see above n.8, pp. 302-303.

³⁶ Since 2001 known as the Bureau of Alcohol, Tobacco, Firearms and Explosives.

³⁷ Gialamas DM. Enhancement of fire scene investigations using accelerant detection canines. *Sci Justice* 1996; 36 (1): 51-54, p. 51.

³⁸ Stauffer et al., see above n.5; Gregory CP and Associates. *Company history*, <http://www.cpgregory.co.uk> (2017, accessed 1 March 2017).

³⁹ Lentini, see above n.6, p. 517.

Common target substances for ADCs include petrol, diesel, paraffin, lighter fuel, white spirit, barbecue lighter fluid, turpentine substitute, cellulose thinners, methylated sprits and acetone. Dogs are understood to have an olfactory capability at least forty-four times better than humans and are capable of being trained to detect ILR with a high degree of sensitivity and discriminatory power.⁴⁰ In addition ADCs can complete the search of a fire scene considerably quicker and with greater accuracy than a fire investigator armed with an electronic detector.

The success of ADCs and the close relationship between the dogs, their handlers and fire investigators means that investigators of arson are often the most ardent supporters of the use of canines in the search for ILR.⁴¹ In addition, the dog plays a special role in popular culture and their ability to perform amazing and unusual feats is often unquestioned.⁴² As such it is not uncommon to find reports of outstanding performance by ADCs. Examples include a dog handler giving evidence during criminal court proceedings that their dog was “100% correct, every time”,⁴³ another handler identifying a specific ILR in court based on the response of their dog,⁴⁴ and a UK fire service website claiming that their fire investigation dog can differentiate between hydrocarbons produced during combustion

⁴⁰ Furton KJ, Carabello NI, Cerreta MM et al. Advances in the use of odor as forensic evidence through optimizing and standardizing instruments and canines. *Phil Trans R Soc B* 2015. DOI:10.1098/rstb.2014.0262.

⁴¹ Ottley, see above n.20, p. 271.

⁴² Myers RE. Detector dogs and probable cause. *Bepress Legal Series* 1220, <http://law.bepress.com> (2006, accessed 1 March 2017).

⁴³ Plummer CM and Syed IJ. “Shifted science” revisited: Percolation delays and the persistence of wrongful convictions based on outdated science. *Cleve State L Rev*, 2016; 64 (3): 483-518, p. 489.

⁴⁴ Lentini, see above n.6, pp. 483-498.

from those introduced by an arsonist.⁴⁵ These types of performance claims are disputed by established research data. Although the canine's olfactory system is widely relied on, the system itself is not completely understood and it is not known what exactly triggers a dog alert.⁴⁶ It is therefore unclear which specific chemical compounds, or combinations of chemical compounds, produce a positive indication as the canine is trained on a range of target substances.

During the pyrolysis process, which is necessary for the combustion of most fuels, the solid or liquid fuel undergoes a thermal degradation into smaller volatile molecules. Pyrolysis of a given material can produce many different thermal degradation substances known as pyrolysis products. Modern synthetic polymers produce pyrolysis materials that are identical to those found in ILR and these residual petroleum distillates can trigger an alert by an ADC. Such alerts are known as false positives as they can occur where no ILR is present.⁴⁷

These factors mean that a positive indication for the presence of an ILR in a fire scene, from either an electronic detector or an ADC, should not be regarded as proof of the presence of an ignitable liquid. Both these techniques of detection should be treated as

⁴⁵ South Wales Fire Service. Fire investigation dogs, www.southwales-fire.gov.uk/English/yoursafety/arson/Pages/FireInvestigationDogs.aspx (2017, accessed 26 June 2017).

⁴⁶ Furton et al., see above n.40; Kurz ME, Schultz S, Griffith J et al. Effect of background interference on accelerant detection by canines. *J Forensic Sci* 1996; 41 (5): 863-878.

⁴⁷ Stauffer et al., see above n.5; Scott A. Taking a bite out of forensic science: The misuse of accelerant detecting dogs in arson cases. *J Marshall L Rev* 2015; 48 (4): 1149-1176, p. 1165.

presumptive tests for ignitable liquids due to the possibility of a false positive result being obtained. Confirmation of the presence of, and the identification of, an ignitable liquid can only be achieved by the examination of a suitable sample by a qualified analyst in a laboratory environment or on scene if suitable portable equipment is available. Hence electronic detectors and ADCs should be considered as tools for helping a fire investigator select and obtain quality samples for laboratory examination.⁴⁸ Laboratory testing of a sample from a potential detection may result in a negative result for the presence of an ignitable liquid. This could be due to the absence of any ILR in the sample, the presence of an ILR below detection limits, or from the presence of interfering products. Interfering products include precursory products, pyrolysis products, combustion products and firefighting products and are defined as those substances that interfere with the analysis process and prevent the proper identification of ILRs.⁴⁹

When ADCs first became operational it was widely accepted that the dogs could detect ILR at a level below the capability of laboratory equipment. However, the sensitivity of analytical equipment has improved significantly in recent decades and these instruments have increasingly lower detection limits. These advances mean that ILRs that previously were only detectable by ADCs can now be detected without a canine response.⁵⁰

Whatever the reason for the failure to detect ILR in a laboratory sample, a negative result

⁴⁸ See e.g. DeHaan and Icove, see above n.8; Stauffer et al., see above n.5; NFPA, see above n.7; Scott, see above n.47.

⁴⁹ Newman R. Interpretation of laboratory data. In: Nic Daeid N (ed) *Fire investigations*. London: CRC Press, 2014, pp.155-190; Stauffer et al., see above n.5, p. 452.

⁵⁰ Lentini, see above n.22; Scott, see above n.47, p. 1158; Furton et al., see above n.40, p. 2.

means that there is no physical evidence for the presence of ILR in the fire debris. Such positive detector alerts that result in negative laboratory tests are known as unconfirmed alerts.⁵¹

Even if a detection method has accurately located an ILR in a fire scene and a confirmatory identification has been obtained, it must still be established whether or not its presence can be considered to be an accelerant. Even laboratory testing cannot differentiate between an incidental ignitable liquid and an ignitable liquid accelerant. To establish the presence of an accelerant, the identification of the detected substance is required together with an analysis of its context within the fire scene.⁵²

An indication from an electronic detector or from an ADC can therefore provide no proof of either the presence of an ignitable liquid or of the use of an accelerant. A fire investigator or dog handler carrying out a search for ILR could be expected to give evidence in court regarding a positive alert only with regard to the process of identifying relevant samples for further examination. This has proven to be the case with electronic detection methods. However, despite the disagreement of the scientific community, unconfirmed canine alerts have been, and continue to be, presented in criminal courts as evidence of the presence of an accelerant.⁵³

⁵¹ Kurz et al., see above n.46, p. 872; Scott, see above n.47, p. 1158.

⁵² DeHaan and Icove, see above n.8, p. 303; Scott, see above n.47, p. 1157.

⁵³ See e.g. Ottley, see above n.20; Lentini, see above n.22; Scott, see above n.47.

Admissibility of expert evidence in England and Wales

It is generally recognised that the case of *Folkes v Chadd* (1782)⁵⁴ provided the legal precedent for the admittance of modern expert witness testimony in English law. In *Folkes v Chadd* an appeal court advised that an expert's opinion should be deemed admissible if it furnished the court with information that was beyond the common knowledge and experience of the jury.

The admissibility framework for expert evidence was clarified in *R v Turner*⁵⁵ in 1975, which reiterated that an expert's opinion can be adduced only if it is based on admissible facts and will furnish the court with scientific information which is likely to be outside of the knowledge and experience of a judge or jury. The ruling went on to say that if, on the proven facts, a jury could form their own conclusions then an expert would be unnecessary.

These guidelines were subsequently expanded upon by the regular citing in the Court of Appeal (Criminal Division) for England and Wales of the 1984 decision in the South African case of *R v Bonython*.⁵⁶ The admissibility of expert evidence in *Bonython* was determined by three factors; whether a person without specialist knowledge would be able to reach a sound judgement on the matter in question without an expert, whether the matter formed part of a body of knowledge which is sufficiently recognised to be reliable

⁵⁴ *Folkes v Chadd* (1782) 3 Doug. KB 157.

⁵⁵ *R v Turner* [1975] QB 834.

⁵⁶ *R v Bonython* (1984) 38 SASR 45.

and whether the expert has sufficient knowledge or experience to be able to give an expert opinion.⁵⁷

Further clarification on the admissibility of expert testimony was given in *R v Robb*⁵⁸ in 1991 and *R v Stockwell*⁵⁹ in 1993. In *Robb* it was held that the technique, methodology or field of knowledge with which the expert had based their opinion did not have to be either scientific or generally accepted to be admissible but must be sufficiently established to be reliable. The introduction of testimony based on new developments in a field of study were considered in *Stockwell* with the court ruling that these could be admitted providing they had a proper foundation.

Despite these apparent safeguards on how and when expert evidence could be adduced senior members of the judiciary continued to express concern that unreliable expert testimony was being far too easily admitted by the courts. Moreover, flawed expert evidence was held responsible for a number of serious miscarriages of justice.⁶⁰ These flaws included expert opinion that was not based on facts, that had been reached by following an unsound methodology or were outside of an expert's area of expertise. In short, expert evidence was being admitted too freely, challenged too weakly and accepted

⁵⁷ Law Commission. *The admissibility of expert evidenced in criminal proceedings in England and Wales: A new approach to the determination of evidential reliability*, <http://www.lawcom.gov.uk> (2009, accessed 29 January 2017); Henneberg ML. Admissibility frameworks and scientific evidence: Controversies in relation to shaken baby syndrome/abusive head trauma. *Br J Am Leg Studies* 2015; 4: 555-584.

⁵⁸ *R v Robb* [1991] 93 Cr App R 161.

⁵⁹ *R v Stockwell* [1993] 97 Cr App R260.

⁶⁰ Law Commission, see above n.57.

too readily.⁶¹ Ironically, even the expert testimony given in *Robb* was discredited by the courts in 2003; albeit the conviction stood.⁶²

The Law Commission subsequently carried out a public consultation⁶³ and published a report in 2011 that made a number of recommendations aimed at improving the reliability of expert evidence. The key proposals were for the Government to introduce a statutory admissibility test, where expert evidence would only be adduced if it was deemed sufficiently reliable.⁶⁴ The Government declined to legislate, instead proposing minor amendments to the existing Criminal Procedure Rules. These changes fell short of the recommendation for a statutory test and were aimed at providing judges with more information about the proposed expert evidence and it was hoped these would go some way to reducing the risk of unsafe convictions.⁶⁵

In 2016 the Supreme Court of United Kingdom (UK) ruled on a case brought in Scotland, *Kennedy v Cordia LLP*.⁶⁶ The judgment gave clearer guidance on when expert testimony should be allowed. It set out four considerations which govern the admissibility of expert

⁶¹ Law Commission, see above n.57.

⁶² Henry E. *Recent developments in the use of experts and the admissibility of expert evidence – An international perspective*, <http://qebholliswhiteman.co.uk> (2007, accessed 29 January 2017), pp. 2-3.

⁶³ Law Commission, see above n.57.

⁶⁴ Law Commission. *Expert evidence in criminal proceedings in England and Wales*. Report no. 325, 21 March 2011. London: The Stationary Office.

⁶⁵ Ministry of Justice. *The Government's response to the Law Commission report: Expert evidence in criminal proceedings in England and Wales (Law Com no 325)*. Report, Ministry of Justice, UK, November 2013.

⁶⁶ *Kennedy v Cordia LLP* [2016] UKSC 6.

evidence, known as skilled evidence in Scottish proceedings, and all four considerations were deemed to apply both to opinion evidence and expert evidence of fact:

- (i) Whether the proposed skilled evidence will assist the court in its task;
- (ii) Whether the witness has the necessary knowledge and experience;
- (iii) Whether the witness is impartial in the presentation and assessment of the evidence; and
- (iv) Whether there is a reliable body of knowledge or experience to underpin the expert's evidence.

The Supreme Court judgment can be seen to formally bring together the relevant legal precedents regarding expert evidence stretching back to *Folkes v Chadd*. However, whether this judgment fundamentally improves the reliability of expert testimony and therefore reduces the likelihood of future miscarriages of justice remains to be seen.

Case law from England and Wales

The admissibility of search dog evidence in England and Wales was first established in 1994, in *R v Pieterston*.⁶⁷ The case involved an armed robbery in Marston, Oxford, in May 1993. During the robbery money and property was stolen and placed into a dark blue holdall type bag fitted with a shoulder strap. Staff members of the club managed to raise the alarm approximately five minutes after the robbers had left and the police

⁶⁷ *R v Pieterston* [1994] EWCA Crim 5.

attended immediately. One of the officers that responded was a police dog handler, accompanied by her canine Ben. A search of the surrounding area was carried out along a track established by the dog and a strap was found. Club staff identified the strap as being from the holdall used in the robbery.

A blue holdall and other incriminating evidence was subsequently found at the address of Matthew Pieteron. The holdall was designed to have a shoulder strap fitted, but this was missing. Pieteron, together with another person, was consequently charged and convicted of robbery. During the trial the details of the search, including the police dog following a scent track and arriving at the strap, was admitted into evidence. Pieteron appealed his conviction; one of the grounds of the appeal was that the evidence regarding the tracker dog should not have been admitted, as such evidence was analogous to hearsay evidence. There was only the handler's testimony regarding the actions and reactions of the canine and the latter could obviously not be cross examined. In addition, it was argued that the evidence with regard to such a tracker dog should be considered unreliable as a dog has a will of its own.

In the absence of any relevant British legal precedent the Court of Appeal relied on a number of authorities from other jurisdictions. The court subsequently ruled that if a proper foundation was laid for the reliability of the canine by reason of its training and experience then the evidence should be admitted. However, the court emphasized two

safeguards. Firstly, the proper foundation must be laid with detailed evidence establishing the reliability of the dog, and secondly, the trial judge must direct the jury to take care and look with circumspection at the evidence of tracker dogs, with regard to the fact that they may not be reliable and cannot be cross examined.⁶⁸

In *Pieterston* the Court of Appeal found that a proper foundation had not been established as there had been insufficient details regarding the training and experience of the dog. However, this was not deemed a material irregularity and the appeal failed. *Pieterston* therefore established that canine searches, and the results obtained in the searches, are admissible as evidence in courts in England and Wales, a judgment that reflects a relatively uniform international position.⁶⁹ However, the ruling is generic and applies to all types of search dogs. The *Pieterston* ruling does not provide any guidance to the courts on how ADC alerts should be interpreted and the probative value of an alert, whether confirmed or unconfirmed, in establishing the presence of an accelerant.

Evidence relating to an unconfirmed ADC search was considered by Nottingham Crown Court in 2011, in the trial of Fiona Adams. The case involved an arson fire in a private house that tragically resulted in the deaths of two children.⁷⁰ The investigation into the origin and cause of the fire determined that the fire started inside the front door in the

⁶⁸ *Pieterston*, see above n.67.

⁶⁹ Freckleton I and Selby H. *Expert evidence: Law, practice, procedure and advocacy*. 5th ed. Sydney: Thompson Reuters, 2013.

⁷⁰ The Telegraph. Mother killed two children in house fire to get back at partner. *The Telegraph*, www.telegraph.co.uk (2011 1 February, accessed 6 March 2017).

hallway of the ground floor and had been deliberately set. An ADC carried out a search of the area of origin and alerted for the presence of one of its target substances. Suitable sample were subsequently taken and submitted for laboratory analysis. The testing produced a negative result for the presence of ignitable liquid meaning that the ADC search produced an unconfirmed alert.⁷¹ The criminal investigation nevertheless identified Adams as a suspect and she was charged with six offences including murder and arson with intent to endanger life.⁷²

During the prosecution phase of the trial evidence of the ADC alert in the area of origin was introduced, despite the negative laboratory test result that had followed. This was not robustly challenged by the defence and the unconfirmed ADC alert was accepted by the court.⁷³ The defence case was based on the premise that somebody else had started the fire and the fact that the fire was an act of arson was not disputed in court. The trial concluded in a not guilty verdict. [As the case never progressed to appeal the unconfirmed alert has never been subjected to a legal challenge over its admissibility and the courts never had an opportunity to consider the issues relating to the reliability of unconfirmed alerts. In addition, subsequent testing led the ADC handler to conclude that the dog had actually alerted on pyrolysis products and not ILR.](#)⁷⁴

⁷¹ D. Coss, private communication, 7 April 2016.

⁷² Bakers Solicitors. Bakers Solicitors secure acquittal of Fiona Adams accused of murdering her two children, <http://www.bakerssolicitors.com> (2011, accessed 6 March 2017).

⁷³ Coss, see above n.71.

⁷⁴ Coss, see above n.71.

Another attempt to adduce an unconfirmed ADC alert into a criminal trial was made in St Albans Crown Court in August 2016, where five people were on trial for joint enterprise arson.⁷⁵ The case related to a fire that caused £500,000 worth of damage to a public community center, and the cause of the fire was determined as a deliberate act. During the fire investigation an ADC was deployed to search the area of origin and the dog alerted for the presence of one of its target substances. Further forensic testing was carried out but this gave a negative result for ignitable liquid. It was reported that the results of the tests were not disclosed to the defence prior to the trial. During the trial the prosecution attempted to establish that an accelerant had been used to start the fire, the evidence of which relied entirely on the alert of the ADC. However, the defence challenged this, bringing in an expert witness to dispute the Crown's assertion that an ADC alert provides evidence of an accelerant. On the second day of the trial the prosecution disclosed that the forensic testing had found no evidence of the use of an accelerant and the Crown conceded the point.⁷⁶

The joint enterprise element of the arson offence was based primarily on CCTV footage showing the five defendants within an enclosed area of the property shortly before the fire began. However, the absence of any evidence as to who had started the fire and alternative explanations for why the men were in that location resulted in the defence

⁷⁵ Garden Court Chambers. Five defendants acquitted of £500,000 arson, <http://gardencourtchambers.co.uk> (2016, accessed 6 March 2017).

⁷⁶ Garden Court Chambers, see above n.75.

making a half-time submission for a ruling of no case to answer. This was accepted by the judge and the defendants were acquitted.⁷⁷

These two cases show that evidence relating to unconfirmed alerts by ADCs is deemed admissible in the courts of England and Wales under the guidelines established as a result of *Pieterston*. In the case of Fiona Adams, the evidence of an unconfirmed dog alert was not challenged as it was not relevant to the defence argument and therefore was admitted into evidence without regard to any of the issues surrounding reliability and probative value. With a verdict of not guilty, the case never progressed to an appeal where the admissibility of the ADC evidence could have been challenged. In the joint enterprise arson case, the probative value of an ADC alert in determining the use of an accelerant was challenged, resulting in the subsequent disclosure of the negative test results by the prosecution. Exactly how the judge would have directed the jury with regard to the unconfirmed alert of the ADC will never be known as the case was discontinued. As both of these latter cases took place in Crown Courts and not an appellate court the binding precedent of each case is limited. However, in the absence of a decision from a higher court regarding evidence relating to unconfirmed ADC alerts, these cases are not inconsequential.

Admissibility of expert evidence in the United States of America

⁷⁷ Lewis A. Hatfield £500k arson trial collapses. *Welwyn and Hatfield Times*, <http://www.whtimes.co.uk> (2016 10 August, accessed 6 March 2017).

In the United States of America (USA) the courts traditionally relied on what was known as a marketplace test when considering the admissibility of expert evidence. This test required judges to consider any expert or expertise that consumers were willing to spend money on as being sound enough for adducing in court. This clearly presented problems as consumers were unlikely to consider the needs of the courts when making decisions on what to buy and unreliable or invalid opinions may still have sold well.⁷⁸

The first defined rules on expert evidence admissibility followed the Supreme Court of the United States' judgment in *Frye v US* (1923).⁷⁹ The *Frye* ruling established the 'general acceptance' standard which required scientific evidence to be accepted as reliable by the relevant scientific community before it could be admitted. The subsequent enactment of Rule 702 of the 1975 Federal Rules of Evidence (FRE) required expert testimony to be the result of reliable methodology and based on sufficient facts. However, the failure to clarify whether the *Frye* test had been superseded meant that both sets of rules could be applied in US courts.⁸⁰ Furthermore, despite later legal developments, *Frye* continues to be the admissibility test in California, District of

⁷⁸ Henneberg, see above n.57, p.559; Saks MJ and Faigman DL. Expert evidence after Daubert. *Annu Rev Law Soc Sci* 2005; 1: 105-130, p. 107.

⁷⁹ *Frye v US* (1923) 293.F 1013.

⁸⁰ Cooley CN and Oberfield GS. Increasing forensic evidence's reliability and minimising wrongful convictions: Applying Daubert isn't the only problem. *Tulsa Law Rev* 2007; 42 (2): 285-380.

Columbia, Florida, Illinois, Maryland, New Jersey, New York, Pennsylvania, and Washington.⁸¹

The general acceptance test was reformed by the Supreme Court in the 1993 case of *Daubert v Merrell Dow Pharmaceuticals, Inc.*⁸² In summary, five key factors are acknowledged in *Daubert*, and these should be considered by a court before determining whether expert scientific testimony is scientifically valid and reliable. These are whether a theory, method or technique:

- (i) Can or has been tested,
- (ii) Has been scrutinised through peer review and publication,
- (iii) Has a known or potential rate of error,
- (iv) Has existing standards and controls, and
- (v) Has been generally accepted by a relevant scientific community.

The Supreme Court looked again at the issue of admissibility in *General Electric Co v Joiner* in 1997,⁸³ and verified the gate-keeping role of trial judges, stating that they may exclude expert evidence where there are analytical gaps between the data and the

⁸¹ The Expert Institute. *Daubert v. Frye - A state-by-state comparison*, <https://www.theexpertinstitute.com/daubert-v-frye-a-state-by-state-comparison/> (2017, accessed 6 July 2017).

⁸² *Daubert v Merrell Dow Pharmaceuticals, Inc.*, 509 US 579 (1993).

⁸³ *General Electric Co v Joiner*, 522 US 136 (1997).

opinions proffered. In *Kumho Tire Co Ltd v Carmichael*⁸⁴ in 1999, the Supreme Court further clarified that the gate-keeping role of judges did not only apply to the admission or rejection of scientific evidence, but this discretion extended to all types of expert evidence. These decisions resolved some confusion between the existing rules and, alongside *Daubert*, these two cases now form part of what is commonly referred to as the *Daubert* Trilogy.

Following *Daubert*, FRE 702 was amended and the admissibility of such evidence can now be seen to rely on six points. These can be summarised as: reliability, peer review, defined error rate, general acceptance, recognised methodology and relevance to the case.⁸⁵ In addition, FRE 702 forces courts to examine the empirical underpinning of all such testimony and to exclude evidence connected to the data only by the opinion of an expert.⁸⁶

Case law from the United States of America

In comparison to England and Wales, there is considerably more case law relating to ADC evidence from courts in the USA. The history of ADC evidence in the USA criminal justice system illustrates not only the disputes that surround the subject, but also the different views on the admissibility of such testimony. Prior to 1995, courts routinely

⁸⁴ *Kumho Tire Co Ltd v Carmichael*, 526 US 137 (1999).

⁸⁵ Bosco D et al. The admissibility of offender profiling in the court room: A review of legal issues and court opinions. *Int J Law Psychiat* 2010; 33: 184-191, p. 185.

⁸⁶ Cooley and Oberfield, see above n.80.

held that unconfirmed ADC alerts were admissible as substantive proof of the presence of an accelerant.⁸⁷ The first appellate court to consider the issue, the Delaware Supreme Court in *Reisch v State*⁸⁸ in 1993, affirmed the trial judge's decision to admit the testimony of an ADC. This view began to change in 1996 with the case of *People v Acri*⁸⁹ where the appellate court of Illinois, a *Frye* jurisdiction, was faced with conflicting expert evidence caused by the growing disagreement within the fire investigation community over the value of unconfirmed ADC alerts. The court declined to rule on the issue and instead decided to exclude all of the relevant evidence from the courtroom.⁹⁰ The court's decision in *Acri* reflected a growing concern over unconfirmed alerts in the fire investigation community in the USA.

A notable case involving ADC evidence is the conviction, appeal and subsequent exoneration of Weldon Wayne Carr in Georgia.⁹¹ This case involved lengthy legal processes that took place between 1993 and 2004, covering a number of controversial aspects such as evidence given at trial by an ADC handler on the significance of unconfirmed alerts. On 7 April 1993 Weldon Carr and his wife, Patricia, were asleep in the same bed when they awoke to find their home filled with smoke. During their attempts to escape they became separated and Mr Carr subsequently jumped from a window and raised the alarm. The fire department responded and found Mrs Carr inside

⁸⁷ Plummer and Syed, see above n.43; Lentini, see above n.22.

⁸⁸ *Reisch v State*, No. 426, 1993 Del. LEXIS 229.

⁸⁹ *People v Acri* 662 N.E.2d 115 (Ill. App. Ct. 1996).

⁹⁰ Plummer and Syed, see above n.43, p. 499.

⁹¹ *Carr v State* 482 S.E.2d 314 (Ga 1997).

the house. She was taken to hospital where she died three days later. The investigation concluded that the fire was arson and Weldon Carr was arrested and charged with murder.

During the fire investigation an ADC was deployed to search the house. The dog alerted in twelve separate locations but the subsequent laboratory testing found no evidence of an ignitable liquid in any of the samples. The prosecution team then retested the samples at another laboratory and these too came back negative. However, during the trial the ADC handler testified that the unconfirmed alerts were evidence of the presence of an ignitable liquid accelerant. The defence fire expert, whose role included commenting on the known science of ADCs at the time, was prevented from giving evidence after the judge ruled that he was not qualified to do so as he was not an ADC handler. Carr was subsequently convicted and sentence to life imprisonment.⁹²

Carr appealed his conviction to the Supreme Court of Georgia and one avenue of appeal contested the admissibility of the unconfirmed alerts. Between the time of the initial trial and the appeal both the Forensic Science Committee of the International Association of Arson Investigators and the Technical Committee on Fire Investigations of the National Fire Protection Association had published documents disputing the reliability of

⁹² The National Registry of Exonerations. Weldon Wayne Carr, <http://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=3936> (2012, accessed 19 June 2017).

unconfirmed ADC alerts as evidence of accelerants.⁹³ Carr's appeal lawyers were therefore able to raise doubts over the admissibility of ADC evidence. On 10 March 1997, after several months of deliberation, the court overturned Carr's conviction on the basis that the trial judge had erred in admitting the unconfirmed alert evidence. Despite the appeal ruling the State expressed an intention to retry the case and, as a result, Carr remained on indictment for six more years. He was finally exonerated in June 2004 when no further legal proceedings had been initiated.⁹⁴

The decision in *Carr* can be considered a watershed ruling. It took place during a period when the reliability of ADC unconfirmed alerts as evidence of accelerants was being questioned and subsequently rejected by the fire investigation scientific community. Nevertheless, this ruling has not prevented such evidence from being presented by prosecutors and it has not stopped courts from admitting it.

In *Yell v Commonwealth*,⁹⁵ such evidence was admitted by the trial judge, and a Kentucky appeal court later affirmed this decision. Following a fatal fire investigation, Robert Yell was charged with multiple offences including murder and arson. The trial was held in February 2006 and Yell was convicted of offences including arson and manslaughter and sentenced to fifty-two years in prison.

⁹³ Lentini, see above n.6, pp. 490-493.

⁹⁴ Plummer and Syed, see above n.43.

⁹⁵ *Yell v Commonwealth*, 242 S.W.3d 331, 336 (Ky. 2007).

During the investigation an ADC had alerted to six locations in the fire scene and samples were taken for laboratory analysis. None of the six samples tested positive for an ignitable liquid. The defence objected to the admission of the unconfirmed alerts and submitted a pre-trial suppression motion arguing that there was no scientific support or legal authority in Kentucky for its admissibility. During a *Daubert* style hearing, the court heard evidence from the ADC handler who described the training methods of his dog and testified that false alerts were caused by the ability of the dog to detect lower levels of accelerant than the laboratory equipment could. Despite the fact that the ADC had not been recertified for at least four months prior to the fire the court allowed the evidence, stating that the handler would generally be able to tell if the ADC alert was false or not.⁹⁶

On appeal to the Supreme Court of Kentucky, lawyers for Yell argued that there was no legal authority to allow such evidence pursuant to *Daubert* and no scientific evidence to support the reported ability of the ADCs to detect lower levels of ILR than laboratory equipment. The Commonwealth countered by arguing that *Daubert* did not apply in ADC cases as there was no scientific basis for the detection of ILR by a canine's sense of smell. The appeal judges ruled that *Daubert* was inappropriate in the case of ADC, stating that foundational evidence regarding the canine's training and history together with the handler's qualifications were a better way to judge reliability. In addition the court was satisfied on the reliability of the ADC despite the negative laboratory test

⁹⁶ Ottley, see above n.20.

results. The appeal was therefore dismissed. However, it is worth noting that there was a dissenting opinion on the ADC evidence which recorded that, by approving the testimony of an unconfirmed alert, the Supreme Court of Kentucky was supplanting scientific procedure with an investigative technique.

Yell's legal team filed motions in 2011 and 2012, which were denied, but in May 2016 a motion claiming that the forensic evidence used at trial was now known to be unreliable was granted. On 28 December 2016, the judgment and conviction were vacated and a new trial of Yell was ordered.⁹⁷ However, this decision has since been appealed by the Commonwealth⁹⁸ and the case is currently sitting in the Kentucky Court of Appeals.

Herbert Landry went on trial for arson in Utah in 2006, following a fire in an apartment complex.⁹⁹ During his trial, evidence of unconfirmed ADC alerts were admitted into court even though the Utah Court of Appeals in 2002 had concluded that testimony based on ADC alerts must either be corroborated by laboratory analysis or satisfy the test for admissibility of expert testimony.¹⁰⁰

⁹⁷ Cooper, C. Yell back in Logan County, awaits new trial. *News Democrat & Leader*, <http://www.newsdemocratleader.com> (2017 5 January, accessed 10 July 2017).

⁹⁸ Story, J. Prosecutor appeals judge's decision in fire death of boy. *Bowling Green Daily News*, <http://www.bgdailynews.com> (2017 26 January, accessed 10 July 2017).

⁹⁹ The National Registry of Exonerations. Herbert Landry, <http://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=5078> (2017, accessed 10 July 2017).

¹⁰⁰ See *State v. Schultz*, 2002 UT App 366, 58 P.3d 879.

An ADC had alerted three times in the bedroom, and later on, also on a shoe and sock belonging to Landry. However, laboratory testing showed that the only ignitable substance present in the bedroom floor board samples was heptane, a component of the construction adhesive used to glue down carpets and components of a subfloor.¹⁰¹ The shoe and the sock tested negative for ILR in laboratory analysis. Despite this the dog handler went on to testify for the prosecution and even stated that the dog's detection capabilities were more sensitive than laboratory analysis.¹⁰² All evidence against Landry was circumstantial, but with the help of the ADC alerts, the police investigators and the prosecution could piece together an incriminating hypothesis whereby Landry looked like a credible suspect.

In 2016 the Utah Court of Appeals overturned Landry's conviction, and stated that:

*“Not only did [the dog's] alerts on the sock and shoe suggest to the jury that an accelerant was used, but it also tied the accelerant to Landry's person, undermining the defense's theory that perhaps someone other than Landry was responsible for causing the fire.”*¹⁰³

This case provides an excellent example of tunnel vision and case construction, as without the unconfirmed dog alerts tying the suspect to the crime scene and to a

¹⁰¹ *Landry v. State of Utah*, 2016 UT App 164, ¶5.

¹⁰² *Landry v. State of Utah*, see above n.101, ¶7.

¹⁰³ *Landry v. State of Utah*, see above n.101, ¶29.

suspected accelerant the prosecution would not have had a case against Landry. By relying on the evidence of the unconfirmed ADC alerts through investigation, trial and appeals, the police and the prosecution effectively disregarded any accidental cause of the fire as well as any alternative suspects. Landry's successful appeal focused on ineffective assistance of counsel, in particular the defence's failure to object to the prosecution's use of the unconfirmed ADC evidence and to call an expert to refute such evidence. In January 2017 the prosecution dismissed the charge and Landry was exonerated.

These cases illustrate the continuing variations in how courts in the USA view the admissibility of unconfirmed ADC alerts. This disparity across state jurisdictions depends largely on the applicable rules of evidence and the factors that the court use to determine reliability of evidence. Out of the forty states that base admissibility standards on the Federal Rules of Evidence, unconfirmed alerts have been admitted in all but one, and other states have referred to *Daubert* in deciding to admit ADC unconfirmed alerts. In contrast, the three states where courts have ruled unconfirmed alerts inadmissible based their refusal to admit the evidence on the fact that there was a lack of a 'general accepted scientific theory' as set out in *Frye*.¹⁰⁴

Admissibility of expert evidence in Canada

¹⁰⁴ See e.g. Ottley, see above n.20; Lentini, see above n.6; Scott, see above n.47.

The classic Canadian legal statement on the admissibility of expert evidence can be summed up by the 1931 case of *Kelliher (Village of) v Smith*¹⁰⁵ in which the Supreme Court of Canada ruled that:

“The subject matter of the inquiry must be such that ordinary people are unlikely to form a correct judgment about it, if unassisted by persons with special knowledge.”

In effect, this standard meant that for an expert’s opinion to be admitted, it must only need to be considered helpful to the court. However, the concern over the potential for expert witnesses to overwhelm legal proceedings and distort the fact-finding process led to a 1994 landmark ruling on admissibility by the Supreme Court of Canada. The decision in *R v Mohan*¹⁰⁶ noted that the admittance of expert evidence was governed by four factors; relevance, necessity to assist the trier of fact, the absence of an exclusory rule and the proper qualification of the expert. This effectively changed the traditional view of expert evidence needing only to be ‘helpful’ to a higher standard requiring that it must be necessary to resolve the dispute. In addition, the decision in *Mohan* emphasised that the expert evidence should be excluded if the potential for prejudice substantially outweighed the probative value.¹⁰⁷

¹⁰⁵ *Kelliher (Village of) v Smith* [1931] SCR 672.

¹⁰⁶ *R v Mohan* [1994] 2 SCR 9.

¹⁰⁷ Stewart H and Piché C. The legal framework for scientific evidence. In National Judicial Institute (ed) *Science manual for Canadian judges*. Ottawa: National Judicial Institute, 2013, pp. 19-38, p. 21; Glancy GD and Bradford JMW. The admissibility of expert evidence in Canada. *J Am Acad Psychiatry Law* 2007; 35: 350-356, p. 351.

This ruling that the prejudicial effect of admitting the evidence must not overshadow its probative value was affirmed in 1998 in *R v B.M.*;¹⁰⁸ a ruling that also noted that the influence of an expert's testimony on a jury may be out of proportion to its reliability. In order to ensure reliability the court stated that an expert must express an opinion that is in common use within the relevant scientific community. This statement can be seen to echo the 'general acceptance' standard laid down in *Frye* in the USA. However, in *R v J (J-L)*¹⁰⁹ in 1999, the Supreme Court of Canada reviewed the criteria laid down in *Mohan*, rejecting the general acceptance theory seen in *Frye* and instead accepting the reliability framework of *Daubert*. The court's decision emphasised that trial judges must take seriously the role of 'gatekeepers' in scrutinising expert testimony.

In 2008 the Canadian Federal Court Rules Committee reported that experts advocating on behalf of a party can diminish both the reliability and the usefulness of the expert's evidence.¹¹⁰ Nonetheless, a year later, in *R v Abbey*¹¹¹ in 2009, the Court of Appeal for Ontario restated and expanded both the *Mohan* criteria and the role of judges as gatekeepers. The ruling treated the admissibility assessment of expert evidence as a two stage process; assessing preconditions to admissibility and protecting the trier of fact

¹⁰⁸ *R v B.M.* [1998] 130 CCC (3d) 173.

¹⁰⁹ *R v J (J-L)* [1999] 130 CCC (3d) 541.

¹¹⁰ Federal Court Rules Committee. Expert witnesses in the federal courts: A discussion paper of the Federal Rules Committee on expert witnesses, cas-cdc-www.02.cas-satj.gc.ca/fca-caf/pdf/Discussion-May-2008_eng.pdf (2008, accessed 4 February 2017), p. 1.

¹¹¹ *R v Abbey* [2009] ONCA 624 97 OR (3d) 330.

from insufficiently probative testimony. The court stated that four preconditions must be met:

- (i) The proposed opinion must relate to a subject matter that is properly the subject of expert opinion evidence;
- (ii) The witness must be qualified to give the opinion;
- (iii) The proposed opinion must not run afoul of any exclusory rule apart entirely from the expert opinion rule; and
- (iv) The proposed opinion must be logically relevant to a material issue.

If all four preconditions are met the trial judge can then move to act as a gatekeeper, deciding whether the expert evidence is sufficiently beneficial to the trial process.¹¹²

Case law from Canada

In Canada the first attempt to introduce an unconfirmed ADC alert into evidence took place in Ontario in the case of *R v Hughes*¹¹³ in 2005. The case was the result of a non-fatal fire. The fire investigator determined that the fire had been deliberately lit in two locations in the garage of a house and that an ignitable liquid accelerant had been used. CCTV cameras mounted on the premises recorded a BMW car leaving the scene as the

¹¹² Stewart and Piché, see above n.107, p. 22.

¹¹³ *R v Hughes*, 2007 CanLII 20780 (ON SC).

fire started. As a result of the criminal investigation John Hughes was arrested. He owned a BMW car and an ADC search of the car was carried out. The dog alerted on the floor of the car and samples were submitted to the Centre of Forensic Sciences (CFS) for testing. The test did not detect any ILR.

In a preliminary hearing in December 2005 the dog handler testified that his ADC had detected an accelerant on the floor of the vehicle. The court also heard that there was evidence that the ability of a properly trained dog to find accelerant can be superior to the tests carried out by the CFS. At the end of the hearing Hughes was ordered to stand trial on four counts of attempted murder and four counts of arson. Hughes subsequently applied to the Ontario Superior Court of Justice to quash the order to stand trial on the eight counts. The appeal, which was heard in May 2007, was based on potential jurisdictional errors by the preliminary hearing judge and did not involve the ADC evidence. However, in refusing the application the Superior Court reaffirmed that an accelerant had been used.

The case returned to the Ontario Superior Court of Justice in June 2008.¹¹⁴ This time the defence was specifically challenging the admissibility of the unconfirmed alert evidence of the ADC. The Crown was seeking to rely on the unconfirmed alert to prove that an accelerant was present in the area that the dog had signaled. This would link the defendant to the arson scene and provide supporting evidence that the fire had been

¹¹⁴ *R. v Hughes*, 2008 CanLII 29770 (ON SC).

deliberately set. The ADC handler testified once again, detailing the ADC's training and experience and described the annual certification process. However, under questioning the handler conceded that canine alerts that were not confirmed by laboratory analysis should not be relied upon as evidence of the presence of an accelerant. The handler went on to say that, in his experience, approximately 60% of samples taken following his dog's alerts subsequently tested negative. Further testimony was received from an analytical chemist at the CFS who confirmed the current scientific view that such alerts are not valid. In addition, the chemist testified that the sensitivity of ADCs and laboratory equipment was largely the same. Following the testimony received, and a review of the current scientific position on ADC alert evidence, the court ruled that the evidence of the unconfirmed alert would not be admitted as evidence for the presence of an accelerant.

The view that unconfirmed alerts should not be admitted was also found in civil proceedings. In 2007, the Ontario Superior Court of Justice considered a case with evidence relating to four unconfirmed ADC alerts.¹¹⁵ Samples taken from the scene were tested in two separate laboratories but no evidence of ILR was found. The court heard evidence from a fire investigator who had a written agreement with the ADC handler that unless there was laboratory confirmation the ADC alerts were 'meaningless'. The court consequently found that no reliance could be placed on the alleged four alerts with regard to determining the cause of the fire.

¹¹⁵ See *Sagl v Cosburn, Griffiths & Brandham Insurance Brokers Limited*, 2007 CanLII 36644 (ON SC).

Nonetheless, these decisions have not stopped Canadian courts from considering unconfirmed ADC alerts as reliable evidence of accelerants. In *R v Ammar*,¹¹⁶ in 2012, the Provincial Court of Alberta considered an appeal following a preliminary hearing in which Zeidan Ammar was ordered to stand trial for arson. During the fire investigation into a serious 2010 fire at a restaurant and hotel an ADC search was carried out resulting in four alerts. Following the laboratory analysis only one of the four alerts was confirmed with the finding of a light petroleum distillate. For the purpose of the preliminary inquiry the ADC handler was deemed an expert and gave opinion evidence that the dog was more sensitive than the laboratory equipment. A forensic chemist testified that the laboratory equipment did not always detect an ignitable liquid following a dog alert but was unable to say without more research whether the dog was in error in such cases. In reaching its decision that Ammar should stand trial, the accepted the ADC unconfirmed alerts as evidence of ignitable liquid in all four of the alert locations and the chemist's view that the capabilities of accelerant detection dogs are more sensitive than laboratory equipment. However this was only a preliminary hearing, the purpose of which was to determine if there was sufficient evidence upon which a jury could convict. In reaching a decision the judge stated that the quality and reliability of the evidence were issues for the subsequent trial.

Issues surrounding the admissibility of unconfirmed ADC alerts

¹¹⁶ *R v Ammar*, 2012 ABPC 361.

Even though the use of ‘junk science’ in courts has been acknowledged since the 1990s,¹¹⁷ and efforts have been made in the last decade to improve the quality of sciences as well as the understanding of the scope and limitations of sciences,¹¹⁸ England and Wales, Canada and the USA still have rather lax attitudes when it comes to admitting certain types of evidence. A 2013 comparative study of four adversarial jurisdictions (those included here plus Australia) concluded that there were serious problems associated with the use of forensic and medical evidence in court, and that admissibility standards in these jurisdictions frequently did not “contribute to the exclusion (or informed systematic evaluation) of unreliable and speculative forms of incriminating opinion evidence in courts”.¹¹⁹

Cases outlined in this article show that despite sophisticated admissibility frameworks and rules of evidence regarding expert testimony, there are still marked inconsistencies in the way that the courts view unconfirmed ADC alert evidence. In the USA the fire investigation scientific community developed the view that such alerts should not be regarded as valid evidence as long ago as 1994, a position that was ratified by the NFPA

¹¹⁷ For more comprehensive discussions on this see e.g. Huber PW. Junk science and the jury. *U Chi Legal F* 1990; 1: 273-302; Huber PW. *Galileo’s Revenge: Junk science in the court room*. Basic Books, 1991.

¹¹⁸ In relation to the USA, a critical report on the state of the sciences outlined serious deficiencies, see National Research Council. *Strengthening forensic science in the United States: A path forward*. National Academies Press, 2009; whereas in England and Wales, efforts were made to introduce a statutory test for the admissibility of scientific evidence, see Law Commission, above n.64. For a comparative discussion, see e.g. Roach K. Forensic science and miscarriages of justice: Some lessons from comparative experience. *Jurimetrics* 2009; 50: 67-92; Wheate RM and Jamieson A. A tale of two approaches: The NAS report and the Law Commission consultation paper on forensic science. *International Commentary on Evidence* 2009; 7(2): Art. 3.

¹¹⁹ Edmond G, Cole S, Cunliffe E, and Roberts A. Admissibility compared: the reception of incriminating expert evidence (ie, forensic science) in four adversarial jurisdictions. *U Denv Crim L Rev* 2013;3: 31-109, p. 108.

through an emergency amendment in 1996.¹²⁰ In 2012 the Canine Accelerant Detection Association (CADA), the oldest and largest professional association of those involved in ADCs, finally agreed and published a position paper stating that no prosecutor or ADC handler should ever testify that an ignitable liquid is present without laboratory confirmation.¹²¹ However these views, together with watershed court rulings such as *Carr*, have not prevented such evidence coming before the courts.¹²² In England and Wales, and Canada, recent criminal cases have also seen prosecutors attempting to introduce unconfirmed alerts through the admissibility gateways.

In judging whether to admit expert evidence the trial judge must decide on the veracity and validity of individual expert testimony, and the court must be satisfied that an expert witness is qualified to give opinion evidence on the matter in hand.¹²³ In the case of search dog evidence the courts will generally assess the knowledge and experience of the handler and the training of the dog and, if satisfied this enable the handler to give expert opinion testimony. However, fire scene searches should be treated as a special case. Unlike with most crime related search dogs that are trained to find illicit substances such as drugs or explosives, the target substances of ADCs are common products. The fact that an ADC has alerted in a fire scene does not mean an accelerant has been found. Even if the dog has correctly identified an ILR and not a pyrolysis product, the located substance

¹²⁰ Lentini, see above n.22; Deghani-Tafti and Bieber, see above n.9, p.574.

¹²¹ Canine Accelerant Detection Association. *CADA's position on "testifying to negative samples"*, <http://www.CADAFiredogs.com> (2012, accessed 10 August 2017).

¹²² Lentini, see above n.22.

¹²³ Martire KA and Edmond G. Rethinking expert opinion evidence. *Melb UL Rev* 2016; 40: 967-998.

would need to be put into the context of the fire scene and assessed regarding the ignition sequence and development of the fire. Only then could it be considered as an accelerant.

To put such an interpretation of facts before a court would need expert opinion evidence to be presented by a qualified and experienced fire investigator. However, not all ADC handlers are fire investigators. Some, such as the London Fire Brigade's Fire Investigation Search Dog Team undoubtedly are, as their handlers are only recruited from experienced and qualified fire investigators. Elsewhere, ADC handlers have come from a wide variety of backgrounds, for example, recruited from the police, from a non-operational fire service role or from the general population.¹²⁴

An expert testifying beyond their area of expertise has long been recognised as a cause of flawed evidence that can ultimately lead to wrongful convictions. It must therefore be argued that ADC handlers without detailed knowledge of fire investigation would testify outside of their specialist knowledge if they gave opinion evidence on the use of accelerants in a fire scene, and if admitted, such testimony is often unreliable and grossly misleading. For example, in *Hughes* two ADC handlers instructed the court that although the standard texts on which they relied called for laboratory confirmation, given a choice between the manuals and the dog both would "choose the dog".

¹²⁴ Gregory and Associates, see above n.38.

The pressure on prosecutors to introduce unconfirmed alerts may increase where the determination that a fire was deliberately set is based entirely on the opinion of the expert fire investigator. Legal guidance in England and Wales advises the courts that where an expert's evidence is clear and uncontradicted then the jury should accept it.¹²⁵ In effect this means that, in cases of arson where the cause of the fire is disputed by the defendant, the only way to challenge the prosecution case is with contrary expert testimony. This defence approach would be supported by the 2005 English legal precedent set out in *R v Puaca*¹²⁶ which found that in cases where there is obvious difference between experts that cannot be resolved then the defendant should be acquitted.

Expert witnesses are required to assist the court rather than the party that instructs them but doubts over the ability of experts to remain impartial are common. The USA and Canada have voiced similar concerns over the extensive use of experts in adversarial proceedings and the danger that this presents. It is clear that any adversarial system contains an inherent problem as two opposing views are presented to a group of lay people who form the jury, and truth is not necessarily a part of the fact-finding mission that the opposing sides pursue through, for example, the use of experts.¹²⁷ A 2002 survey of judges and attorneys in the USA found that adversarial bias, which arises as a result of

¹²⁵ Bond Solon Training, see above n.11.

¹²⁶ *R v Puaca* [2005] EWCA Crim 3001.

¹²⁷ Henneberg M. Worlds apart: Cold case reviews and investigations into alleged wrongful convictions in England and Wales. *Journal of Cold Case Review* 2017; 3 (1): 25-38, p. 30.

a party to court proceedings retaining an expert to advance its cause,¹²⁸ was considered to be the single most important problem with expert testimony in the courtroom.¹²⁹ Furthermore, a 2016 UK survey found that a third of expert witnesses reported being pressured to change their evidence in a way that damaged their impartiality and that half had come across a ‘hired gun’ in court.¹³⁰

Forensic evidence supporting the cause of the fire as arson would be of great value in resolving a dispute between experts. A laboratory test that confirmed the presence of an ignitable liquid would clearly provide compelling evidence to support the presence of an accelerant and, if available, it is inconceivable that a prosecutor would not seek to introduce the test results as evidence. Attempts by handlers and prosecutors to explain the lack of a positive laboratory test as simply due to the increased sensitivity of ADCs over laboratory equipment ignores not only the reliability concerns over unconfirmed alerts but also the capabilities of modern forensic equipment. Therefore, attempts to adduce unconfirmed alerts can be seen as an attempt to persuade a jury that there is evidence of an accelerant when, in fact, the opposite is the case.

Probative versus prejudicial value

¹²⁸ Bernstein D E. Expert witness adversarial bias, and the (partial) failure of the Daubert revolution. *Iowa Law Rev* 2008; 93: 451-489, p.453.

¹²⁹ Federal Court Rules Committee, see above n.110, p. 1.

¹³⁰ Bond Solon. *Annual expert witness survey report 2016*, <http://www.bondsolon.com> (2016, accessed 12 March 2017).

Misrepresentation of the strength or value of scientific evidence through expert opinion testimony is a potential cause of wrongful convictions. Presenting evidence as probative when in fact it is not can result in a false picture of guilt,¹³¹ whereby circumstantial factors that support the incriminating hypothesis become exaggerated while other equally viable lines of enquiry may be ignored or their potential value minimised.¹³² The importance of fire investigators ensuring that the evidence they provide, not only in court proceedings but also to criminal investigations, is scientifically valid, reliable and robust cannot be overstated.

To regard an ADC alert as confirmation of the use of an accelerant in a fire scene considerably overstates the probative value of the actual evidence. Given that the view of the fire investigation scientific community is that an unconfirmed ADC alert should not even be considered as providing proof of the presence of ILR, let alone an accelerant, the probative value of an unconfirmed alert is minimal. Yet the popularity of dogs often results in juries assigning great weight to their related evidence. In 1994, in *People v Cruz*,¹³³ the Supreme Court of Illinois noted the practice of attributing ‘superstitious awe’ to the capabilities of a dog’s sense of smell. The effect that these beliefs have on the judicial process can be demonstrated by the opinion of the prosecutor in the case of *Carr* who, following the conviction, stated that juries would rather believe a dog than a

¹³¹ Henneberg and Loveday, see above n.3, p. 500.

¹³² House of Commons Home Affairs Committee. New landscape of policing: Written evidence submitted by South Wales against Wrongful Conviction (NLP47), <https://www.publications.parliament.uk/pa/cm2011> (2011, accessed 5 July 2017).

¹³³ *People v Cruz*, 643 N.E.2d 636, 662 (1994).

person.¹³⁴ The fact that ADC evidence can be so persuasive to juries may be considered a lifeline by prosecutors struggling to demonstrate forensic proof that a fire was the result of arson, and may indicate bias within the investigation in the form of case construction. Even the term ‘accelerant detection canine’ can be misleading as it suggests that the dogs are detecting accelerants rather than ignitable liquids. An accelerant detector that indicated during a search could easily be construed by a juror that an accelerant had really been detected. This point has recently been recognised by the NFPA who have moved to change the description of the dogs to “ignitable liquid detection canines”, a change currently planned to be introduced with the publication of the 2020 edition of NFPA 921.¹³⁵

The courts of England and Wales, the USA and Canada all have a duty to ensure that legal proceedings are fair. The fact that an unconfirmed ADC alert has such limited value in proving the presence of an accelerant compared with the weight that juries are likely to attribute to the handler’s testimony means that the prejudicial effect of admitting the evidence is almost certain to outweigh its probative value. In England and Wales, the courts have a general discretion to exclude prosecution evidence under Section 78 of the Police and Criminal Evidence Act (PACE) 1984 if it appears that admission of the evidence would have such an adverse effect on the fairness of the proceedings that the

¹³⁴ Lentini, see above n.6, p. 494.

¹³⁵ NFPA. Final report of the NFPA 921, 2020 edition canine task group, <http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=921&tab=nextedition> (2017, accessed 19 August 2017).

court ought not to admit it. Under PACE, the test that is applied is effectively the common-law test for the exclusion of evidence, namely whether the prejudicial effect of admitting the evidence outweighs the likely probative value.¹³⁶

In the USA, rule 403 of the FRE enables courts to exclude relevant evidence if its probative value is substantially outweighed by a danger of unfair prejudice or misleading a jury. In the 2006 case of *State v Sharp*¹³⁷ a New Jersey superior court considered rule 403 and decided that the probative value of unconfirmed ADC alerts was minimal and carried a substantial risk of confusing the issues and misleading the jury. The judge went on to say that such evidence went to the heart of the issue, whether the cause of the fire was accidental or deliberate, and the prejudicial effect substantially outweighed the probative value, and the evidence was excluded.

In Canada, the landmark decision in *Mohan* stated that expert evidence should be excluded if the potential for prejudice substantially outweighed the probative value and this decision was later reaffirmed in *R v B.M.* In addition, expert testimony was recognised as having an influence over the trier of fact that may be out of proportion to its reliability and that expert evidence should not be admitted where there is a danger that it will be misused or will distort the fact-finding process.

¹³⁶ Bond Solon Training, see above n.11, p. 62.

¹³⁷ *State v Sharp* 928 A.2d 165, 168 (N.J. Super. Ct. Law Div. 2006).

These legislative and procedural frameworks give clear guidance that courts should not admit evidence where to do so would be unfair to the defendant. Admitting unconfirmed ADC alerts that are considered by all scientific fire investigators and by CADA to have virtually no probative value for the presence of an accelerant, yet are likely to be viewed as reliable and compelling evidence by the jury, should be regarded as highly prejudicial and such opinion testimony should be excluded. In addition, investigators, ADC handlers and prosecutors should not seek to present such flawed and misleading evidence to juries.

Conclusion

This article has shown that fire and arson investigations are very challenging and these must, therefore, follow strict scientific methodology to produce evidence that is valid, robust and reliable, forensically sound, and which can be presented in court. One area of major concern that has been examined is the identification of the use of an ignitable liquid accelerant to aid the ignition or spread of a fire. The use of an ADC in detecting ILR is common, however, if an ADC has alerted to the presence of a target substance this must be confirmed through laboratory testing. However, as this article has highlighted, this does not always take place and, where such testing is carried out, negative results disproving the ADC alert may not be disclosed or raised in court.

This leads to a number of critical issues from (alleged) crime scene to court and through to any attempt to appeal a subsequent conviction. There are links between the use of

unconfirmed ADC alerts and what is known as tunnel vision and case construction within criminal investigations. Using unconfirmed dog alerts to build a false picture of guilt around one suspect not only disregards an accidental cause of a fire, but it also effectively eliminates other potential suspects. Unconfirmed ADC alerts have been, and continue to be, admitted into courts in England and Wales, USA and Canada. Cases referred to in this article have shown that there is no uniform approach to the admissibility of unconfirmed dog alerts even within the same jurisdiction. To suggest that this is problematic is an understatement. An unconfirmed ADC alert has minimal probative value but can, when presented in court, have immense prejudicial consequences.

ADCs are valuable investigative tools and handler testimony can rightly be used as evidence of a recognised search technique. However, the presentation of unconfirmed ADC alerts as evidence of arson is not compatible with modern forensic and scientific standards. The authors conclude that ADC alerts should only be admitted into court as such alongside evidence from laboratory analysis confirming that an ignitable liquid is indeed present and from a fire investigator regarding its context in the fire scene. Failure to produce confirmatory laboratory analysis should render the presentation of the ADC alert as evidence of the presence of ILR inadmissible in all courts. Furthermore, any conviction where unconfirmed ADC alerts have been used as evidence of arson needs to be re-examined within the context of a new appeal.